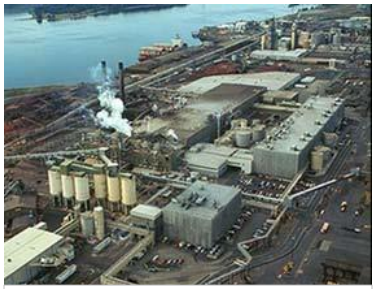
Customer Roundtables:
Demand Response

August 2018

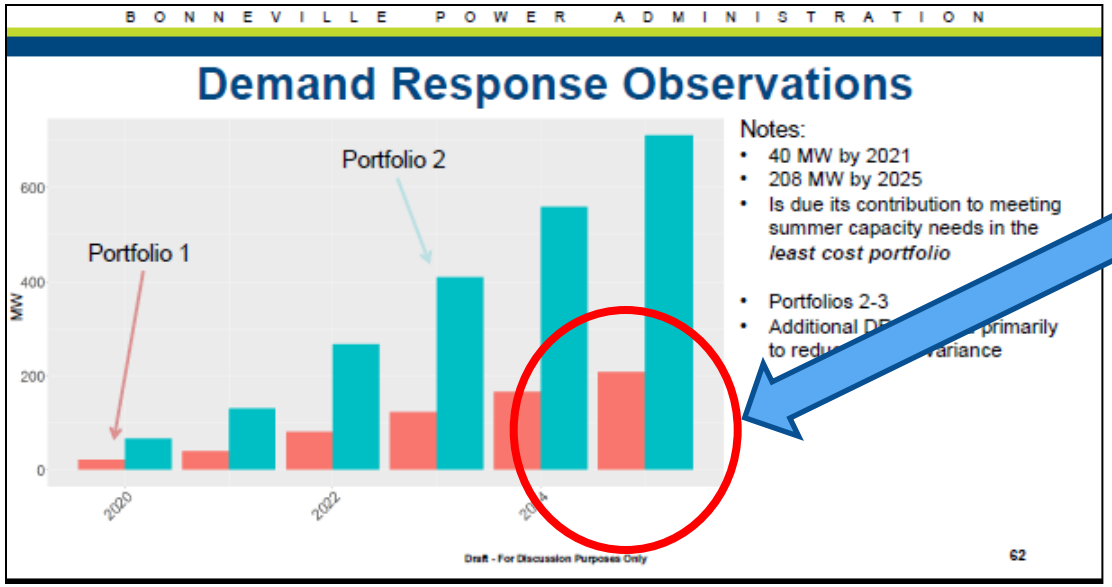


Agenda

- Role of Demand Response at BPA
- Recent DER/DR Initiatives at BPA
- Utility Based DR Programs
- What's on the Horizon
- Wrap-Up

Role of DR at BPA: Provide a Least Cost, Reliable Option to Meet Power and Transmission Needs.

POWER CAPACITY

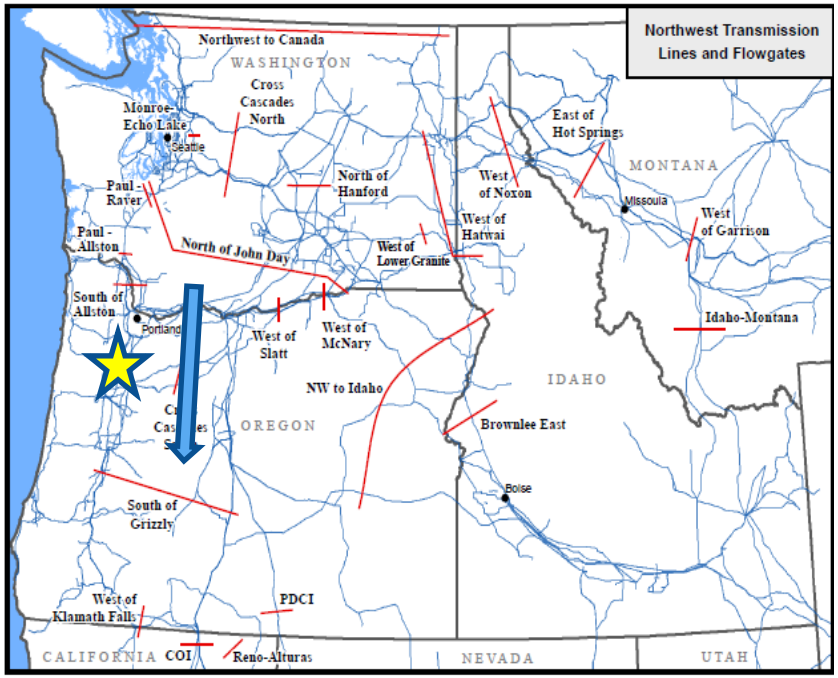


BPA Resource Program Shows a Growing Summer Capacity Gap Starting in 2020.

Demand Response Selected as a Least Cost Resource.

Role of DR at BPA: Provide a Least Cost, Reliable Option to Meet Power and Transmission Needs.

TRANSMISSION NON-WIRES & CONGESTION RELIEF



DR being explored as a Non-Wires Resource.

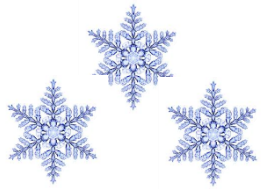
Current demonstration for the South of Allston (I5) Path includes the City of McMinnville (46MW).

Other areas being reviewed include but are not limited to North Idaho and the Tri-Cities.

Recent DER/DR Initiatives at BPA

• DR Potential & Barriers Study • DER Benchmarking	Market Analysis
• DR Demonstrations • CTA 2045 Water Heaters	Capability Building & Market Tests

2017 Potential Study Result: >1500 MW of Achievable DR in BPA Public Service Territory



Area	Winter Achievable Potential (MW)	Percent of Area System Peak—Winter	Summer Achievable Potential (MW)	Percent of Area System Peak—Summer
West	1,061	9.9%	807	10.8%
East	490	9.6%	795	13.5%
Total	**1,551**	**9.8%**	**1,602**	**12.0%**

The base case was developed by benchmarking research participation rates of common programs. These participation rates are generally a median value and are intended to depict participation in a healthy, established DR program. Most of the products reach a **full ramp within 7 years,** and after that grow with anticipated load rate changes.

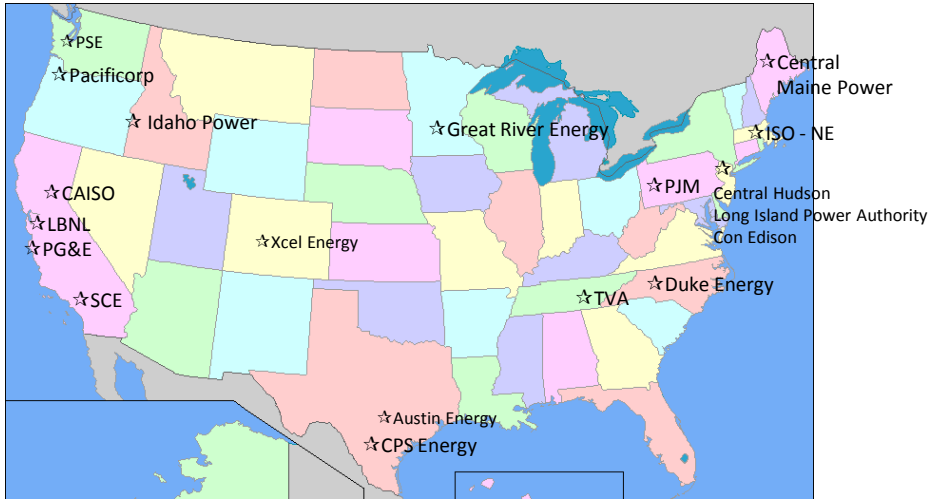
The base case values represent the **mean of a range**.

2017 Barriers Study - BPA Customers State a Clear Price Signal is Needed for DR to Grow

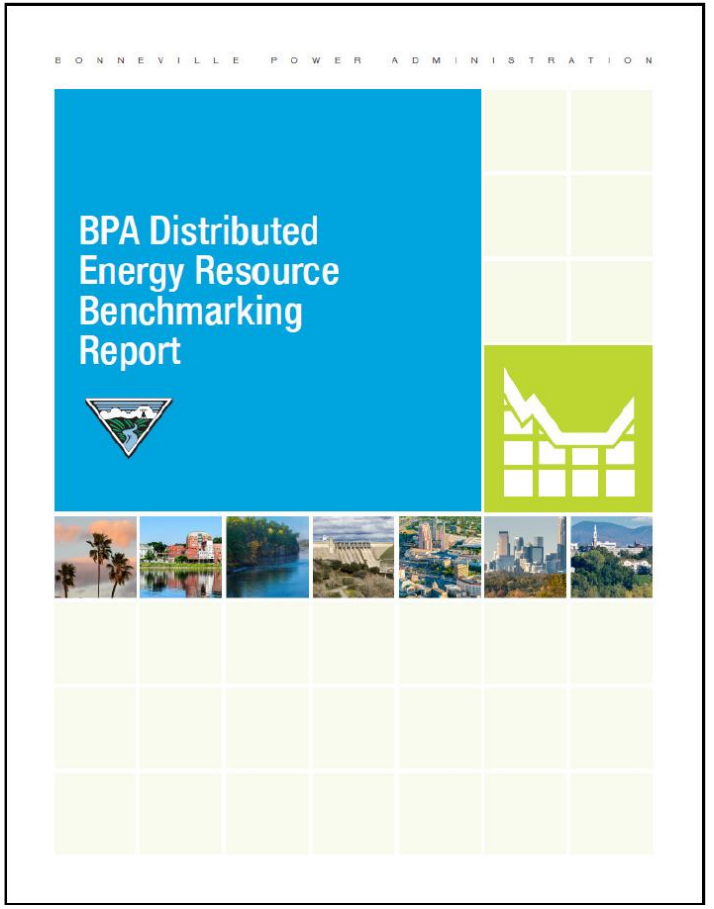
Barrier	Demand Response				Distributed Generation				Energy Storage			
	SME n=17	STK n=12	PC n=25	DSP n=7	SME n=16	STK n=12	PC n=25	DSP	SME n=16	STK n=12	PC n=24	DSP n=4
Economic/Market												
Lack of power customer business case	65%	75%	73%	86%	56%	83%	72%		81%	83%	76%	75%
Lack of clearly defined need/value to BPA	59%	42%	64%	100%	56%	42%	56%		50%	50%	58%	75%
Low power costs	56%	46%	70%	71%	59%	92%	85%		65%	58%	69%	25%
Absence of organized market for DERs	61%	54%	59%	57%	13%	23%	24%		35%	46%	55%	50%
Cost of development/ deployment	50%	46%	68%	29%	59%	77%	67%		88%	85%	89%	50%
Lack of well-defined M&V framework	46%	18%	35%	14%	33%	27%	14%		50%	27%	41%	25%
Organizational/Operational												
Competition for human/financial resources	63%	46%	58%	17%	43%	46%	39%		43%	36%	36%	25%
Lack of staff knowledge and capability	44%	50%	30%	43%	47%	50%	19%		47%	58%	23%	0%
Lack of standardized technical specs/agreements	35%	39%	48%	40%	20%	15%	29%		33%	25%	38%	0%
Insufficient intra-organizational coordination/ communication	27%	50%	17%	29%	15%	40%	25%		23%	33%	22%	67%
Infrastructure/Technology												
Data issues (e.g. lack of AMI, poor "big data" tools)	54%	39%	38%	60%	30%	25%	17%		50%	25%	30%	67%
Back office systems	50%	60%	52%	0%	46%	30%	39%		46%	70%	38%	25%
Communication protocols not standard; interoperability issues	36%	50%	48%	0%	18%	18%	17%		27%	46%	30%	25%
Difficulty integrating DERs with current infrastructure	24%	23%	54%	20%	33%	31%	19%		47%	23%	36%	0%
Concerns about cybersecurity	15%	20%	48%	14%	8%	20%	32%		8%	10%	33%	0%
Lack of test facilities & infrastructure for communications to distributed devices	23%	27%	30%	0%	23%	18%	22%		31%	55%	18%	0%
Ability to control/ manage EV charging and discharging	25%	33%	30%	20%	13%	11%	16%		14%	40%	30%	0%
Unstable vendor supply chain	39%	25%	29%	20%	18%	17%	21%		46%	36%	39%	0%
Legal/Regulatory												
Lack of established tariffs & contracts for DER	33%	63%	50%	60%	21%	44%	32%		39%	75%	35%	75%
Concerns about data privacy	31%	27%	54%	14%	8%	9%	24%		8%	10%	29%	0%
Environmental regulation/compliance and permitting/siting issues					0%	0%	24%		33%	42%	18%	0%

Source: Cadmus DER barriers rating survey
Percent of respondents rating the barrier as a 4 or 5 on a 1 to 5 significance rating scale
SME=BPA subject matter expert; STK=external stakeholder; PC= BPA power customer; DSP=DER service provider
Note: Sample sizes identified are maximum sample size for each interview group and DER category. Due to small sample sizes, results should be interpreted as directional

BPA has Also Benchmarked How Other Utilities Have Built their Programs



Sample Topics	What type of DR products are being used and in what quantities? What thermostat programs are being built? How were customers incented to participate? What is DR being used for?



2016 and 2017 Benchmarking Reports are available per the link on final page of the DR Presentation.

Regional Demonstrations with Utility Partners Around the Region are Being Wrapped Up.

Entity	Max MW	Timing	Product Demonstrated	Performance
City of Port Angeles	30	2013 - 2014	Imbalance Capacity	56% / 92%[1]
Energy Northwest I	35	2014 – 2016	Imbalance Capacity	94%
EnerNOC	17	2015 - 2017	Winter Peak Shave	86%[2]
Energy Northwest II	36	Summer 2017	Summer Power Multi-use	100%
South of Allston	46[3]	Summers 2017-2018	Congestion Relief and Commercial Service	in progress
Total Portfolio	164			

[1] Performance with 10 minute notification was 56%; with preschedule notification performance was 92%
[2] Events where performance met 90% of threshold. On average, demonstration delivered 136% of nominated amounts.
[3] South of Allston portfolio includes 2 generation assets – not reflected in totals

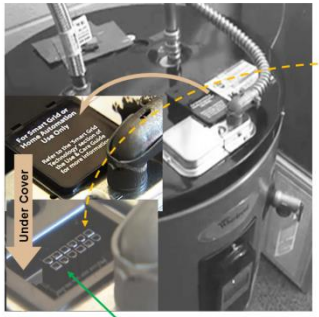
Utility Partners in Large Scale DR Demonstrations – 2014 -2018

Note: Map does not include earlier pilot & technology innovation projects

1. Central Lincoln PUD
2. City of McMinnville
3. City of Milton-Freewater
4. City of Port Angeles
5. City of Richland
6. Clark Public Utilities
7. Columbia River PUD
8. Consumers Power Inc.
9. Cowlitz PUD
10. Eugene Water & Electric Board
11. Fall River Rural Electric Cooperative
12. Ferry County PUD
13. Franklin County PUD
14. Pend Oreille County PUD
15. Snohomish County PUD
16. Umatilla Electric Cooperative

CTA-2045 "Standard Plug-in" Research Pilot

- **New Technology for EWH's and HPWH's:**
  - Standard Port, data format
  - Meeting customer needs
  - Provides customer flexibility
  - Potential for low-cost solution
- **Partners**
  - Bonneville Power Administration
  - Portland General Electric
  - Clark Public Utilities
  - Snohomish County PUD
  - Puget Sound Energy
  - Franklin County PUD
  - Emerald People's Utility District
  - Tacoma Power
  - Springfield Utility Board
  - PNNL
  - NEEA
- **Report to be Completed Oct 2018**



ANSI/CTA-2045 socket on tank

Like USB, Customer plugs the comm device into socket on tank

ANSI/CTA-2045 "plug" on communication device

Example of communication device from e-Radio

Customer Driven DR Pilots/Programs Are Being Conducted (Examples Below)

- **Flathead Electric Cooperative:** Electric Water Heaters
- **City of Milton Freewater:** Electric Water Heaters, Residential Space Heating, Residential A/C, City Water Pumps and DVR
- **Kootenai Electric:** DVR
- **Midstate Electric:** Thermostats
- **Tacoma Power:** Industrial

Flathead Electric Cooperative > Residential > Peak Time Rebate Program

PEAK TIME REBATE PROGRAM

ABOUT THE PROGRAM

DO YOU HAVE AN ELECTRIC WATER HEATER?
SAVING $48 IS AS EASY AS 1, 2, 3...

1

CLICK OR CALL

Complete the form below or call 406-751-1834 to sign up for the Peak Time Rebate Program.

2

WE INSTALL

A device on your water heater that helps reduce your energy demand and costs by turning it off for a short time during periods of peak demand.

3

YOU SAVE

$48 per year when we pass that savings onto you via an automatic $4 per month bill credit.

For additional information or assistance, **read our FAQs**, call 406-751-1834 or **email us**.

What's on The Horizon for BPA

✓**Possible Program for Power.**
Based on capacity needs in the 2018 Resource Program.

✓ **Possible Non-Wires DR in selected areas.**

✓ **Possible Thermostat Program (combining EE and DR).**

✓ **Utility scale battery storage being evaluated.**

Utility Scale Batteries

Hardeson Substation battery, Snohomish PUD7

Wrap-Up

- **BPA Contact**
  - Lee Hall,
    DER Program Manager
    ljhall@bpa.gov
    (503) 230-5189
- **Resources**
  - DR Demonstration Reports
  - 2017 DR Potential Study
  - 2016 and 2017 Benchmarking reports
    https://www.bpa.gov/EE/Technology/demand-response/Pages/Resources.aspx
- **Next Utility Cross-share**
  - Portland/Vancouver area – early November 2018